VIRTUAL PRIME VENDOR

SHORT TERM PROJECT

ARN FINAL TECHNICAL REPORT

- QLM/Local at Fort Leonard Wood -

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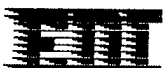**(Delivery Order Number – 0008)**

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11. SUPPLEMENTARY NOTES

13. ABSTRACT *(Maximum 200 Words)*

This paper presents a summary of the results of the Apparel Research Network's (ARN) installation of the Quality Logistics Management (QLM)/Local wholesale local inventory management system at the Recruit Training Center (RTC), Ft. Leonard Wood, Missouri. The system implementation enabled the Defense Supply Center Philadelphia (DSCP) and the Defense Logistics Agency (DLA) to convert the recruit clothing inventory at the Clothing Initial Issue Points (CIIPS) from retail to wholesale-managed assets.

14. SUBJECT TERMS

Recruit Clothing; Supply Chain; Supply Chain Balancing; Quality Logistics Management System (QLM); Recruit Training Center; Apparel Research Network (ARN); Clothing Initial Issue Point (CIIPS), Ft. Leonard Wood, MO; inventory management.

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PREFACE

The QLM/Local at Fort Leonard Wood implementation is part of the ARN Supply Chain Management system for reduced military clothing supply chain inventories through automated systems for asset visibility at the wholesale, retail and manufacturing levels and balanced flow replenishment. Prior to the implementation at FLW, the ARN system had developed a centralized DataMart (ARN Asset Visibility System), developed a balanced flow replenishment system (BIFRS) and implemented a retail inventory management system (QLM/Retail) at the Marine Corps Recruit Depot in San Diego (MCRD-SD). This development is documented in ARN Final Technical Reports (see Appendix D – ARN Supply Chain Management Final Technical Reports).

Ongoing ARN Supply Chain Management System projects include:

- Development of ASAP for tracking manufacturing assets and electronic invoicing;

- Development of VIM-QLM/Central;

- Implementation of QLM Local at the Remaining Army sites;

- Implementation of the complete ARN Supply Chain Management System at the Marine Corps Recruit Depots;

- Implementation of BIFRS-Wholesale; and,

- Linkage of 3D body scan data to clothing issue data at the MCRD-SD.

ARN Program information is available from the ARN web site at http://arn.iitri.org.

1.0 EXECUTIVE SUMMARY

1.1 Overview

This paper presents a summary of the results of the installation of the QLM/Local wholesale local inventory management system at Ft. Leonard Wood, Missouri (FLW), and provides information on the results of the implementation. The following sections of this document describe the entire implementation process from the initial survey and recommendations to this final technical report.

The success of the implementation is evident throughout the report. The system recommendations were developed based on the guidance from the Department of Defense Logistics Agency that the efforts and system should focus on assisting the Army's effort to reduce inventory investment by implementing technologies and practices developed by the Apparel Research Network (ARN). Detailed guidance was provided throughout the project by ARN program management.

1.2 Project Approach

An ARN Team comprised of five ARN members conducted a three-day assessment at Ft. Leonard Wood. Representatives of the Defense Support Center Philadelphia (DSCP) accompanied the project team during the initial assessment. The Project Team met first with Ft. Leonard Wood personnel to discuss the project requirements and future system alternatives with an emphasis on supporting the objectives of the Ft. Leonard Wood Clothing Initial Issue Point (CIIP) operations.

After careful assessment the ARN Team, DSCP and FLW agreed on an approach that would implement the full ARN Supply Chain System, including QLM/Local, VIM/QLM Central and BIFRS, with DSCP taking ownership of the new clothing inventory assets. Details of this assessment along with a description of the FLW CIIP Operations are included in ARN final technical report, "*Virtual Prime Vendor Short Term Project T1P1 - QLM/Retail at MCRD-San Diego: Appendix A - Fort Leonard Wood Site Visit Review*" (see Appendix D).

1.3 System Architecture

The ARN Asset Visibility System (AAVS) and AAVS DataMart have been created to collect data into a single source to provide Item Managers at the retail (Recruit Training Centers) and wholesale (DSCP) level with clear visibility of all recruit clothing assets (National Stock Numbers [NSNs] within Product Grouping Codes [PGCs]) in all segments of the supply chain. Operational data is extracted from the SAMMS Clothing & Textile (C&T) server and used as the basis for the operational and decision support

capabilities in the Virtual Item Manager (VIM) system incorporating QLM/Central for wholesale inventory management capabilities.
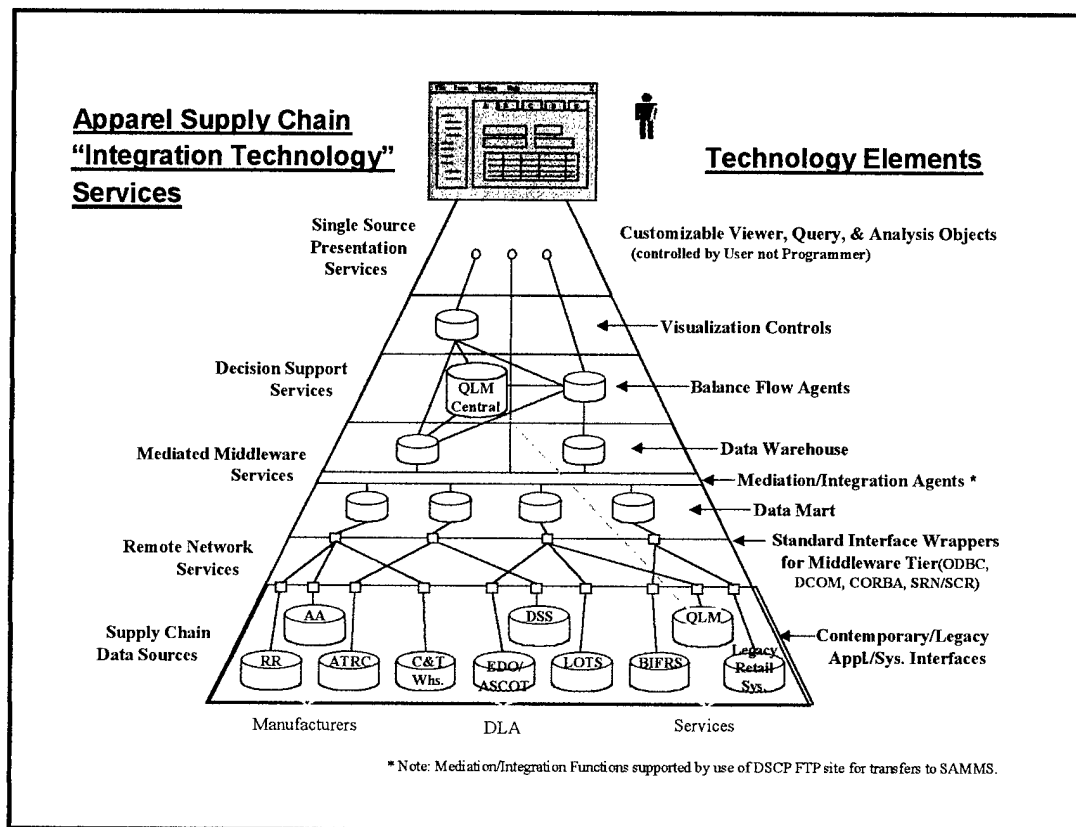
Figure 1 – Systems Architecture.

As shown in Figure 1, the concepts employed in the relationships between ACCIPS, QLM/Local and VIM-QLM-Central provide for inventory management and stock replenishment by linking support and systems from the lowest to the highest levels. At the bottom of the pyramid, the transaction processing capabilities of both ACIIPS and QLM/Local provide for recording of the issue and receipt transactions. This information is "rolled-up" into the AAVS DataMart and displayed to Item Managers via the VIM-QLM/Central capabilities. This allows the managers at the different levels to have visibility of the inventories at both wholesale depot and wholesale local and to manage replenishment as supplies are used to support CIIP operations.

1.4   Implementation

The implementation at FLW took place from August 1999 through May 2000 with post-implementation support through September 2000. The implementation process occurred in several phases. The key steps were site preparation activities, implementation planning and training, go-live, QLM/Local operations and post-implementation support.

Following the initial site survey, the recommendations for the site were prepared and approved, and the hardware/software prepared (hot-staged), shipped and installed. Testing of the system software then followed these initial steps. Concurrent with the installation and testing activities, personnel at Ft. Leonard Wood were provided with initial training related to how the QLM/Local system was designed to provide support along with changes in the use of the ACIIPS to process daily issues.

At the same time the QLM/Local system implementation activities were occurring, there were other logistics activities being accomplished including collection of the ongoing issues data recorded in the Ft. Leonard Wood ACCIPS for the three months preceding the planned go-live date. This information was carefully analyzed as part of the process of data table build and data conversion in preparation for system activation.

QLM/Local officially went live at Ft. Leonard Wood on 25 January 2000. The initial inventory level was $2,932,584.10 (equivalent to 31 annualized days of stock on hand). While the conversion to QLM/Local went smoothly, Ft. Leonard Wood personnel had allowed inventory levels to drop too low just prior to the conversion and QLM/Central-Lite had to generate redistributions for 93 items the prior week to minimize stock shortages at the CIIP.

Today, operations at the Ft. Leonard Wood CIIP are managed with an integrated approach using ACIIPS, QLM/Local and VIM-QLM/Central Operations. ACIIPS today continues to provide transaction registers of the daily issues to recruits and also several standard reports documenting financial transactions.

1.5 Summary

As with any new system, there were numerous difficulties and issues encountered that had to be resolved as efforts progressed. The following items highlight the key lessons learned that needed to be considered for future ACIIPS – QLM/Local conversion and rollout efforts:

- Implementation Planning & Initial Code Set-up;

- Inventory Draw-down levels;

- Shipping Plan/Predictive Forecasting Inventory Replenishment; and,

- Physical Inventory Processes.

The successful resolution of these issues at FLW will significantly improve future implementations of the ACIIPS-QLM/Local rollout.

In conclusion, the VIM-QLM/Central and QLM/Local systems provide the Retail and DSCP Item Managers with the essential abilities to affect both the Retail and the Wholesale inventory draw down objectives, and to monitor and report on progress achieved. The initial reduction in inventory at Ft. Leonard Wood prior to the capitalization/de-capitalization amounted to $3.4 million.

This project has provided several benefits and a substantial return-on-investment for DLA and DSCP. It continues to enhance management of the Ft. Leonard Wood Recruit Training Center wholesale local ("retail local") inventory. Benefits have been provided through the development and implementation of comprehensive decision support tools based on the proven concepts and approaches of the QLM system previously installed at Marine Corps Recruit Depot-San Diego to support operations at that CIIP.

2.0 INTRODUCTION

The Quality Logistics Management (QLM™) Client/Server System (QLM-C/S) has been fully installed and is operational at Fort Leonard Wood, Missouri. The system using QLM/Local supports the functional requirements of the local wholesale supply chain management for recruit clothing. The Army ACIIPS system provides information on issues to QLM/Central. This system is linked for inventory requisitioning purposes to the Defense Supply Center Philadelphia's (DSCP) Automated System for Cataloging and Ordering of Textiles (ASCOT) and the Standard Automated Material Management System (SAMMS) through FTP sites and dial-in programs.

2.1 Overview of System Architecture

The ARN Asset Visibility System (AAVS) and AAVS DataMart have been created to collect data into a single source to provide Item Managers at the retail (Recruit Training Centers) and wholesale (DSCP) level with clear visibility of all recruit clothing assets (National Stock Numbers [NSNs] within Product Grouping Codes [PGCs]) in all segments of the supply chain. Operational data is extracted from the SAMMS Clothing & Textile (C&T) server and used as the basis for the operational and decision support capabilities in the Virtual Item Manager (VIM) system incorporating QLM/Central for wholesale inventory management capabilities.

VIM-QLM/Central has been developed as an independent network server linking C&T SAMMS, AAVS DataMart and QLM/Locals into a single unit/integrated systems approach for recommending relocation of uniform items from "depots" to CIIPs. To accomplish this, the base QLM-Client/Server was modified to use data from the AAVS DataMart for decision support and management of inventory in the supply chain. A web-based interface with the Virtual Item Manager (VIM) was incorporated in VIM-QLM/Central.

VIM was developed to provide a common user interface for Item Managers to use to manage the supply chain using inventory data flowing from the retail and wholesale levels to the AAVS DataMart and VIM-QLM/Central. The Virtual Item Manager (VIM) as it is being developed uses a combination of computer and web-based software that provides Item Managers with the supply chain and inventory information necessary to expedite distribution of assets. The relationships of the systems comprising the supporting information systems architecture are shown in the figure in the preceding section (see Figure 1 – Systems Architecture).

The implementation of QLM/Local as it was implemented at Ft. Leonard Wood (FLW) involved processing the MILSTRIP transactions of the Army Clothing Initial Issue Point System (ACIIPS) through VIM-QLM/Central. After processing, the issue information in MILSTRIP format is transferred to ASCOT and then processed through SAMMS.

This process involves converting the ACIIPS issue data into a format for the Army's conversion to T23 format for processing through the Department of the Army's Standard

Financial System (STANFINS). This STP constituted the first rollout of QLM/Local to a Recruit Training Center (RTC) to support CIIP operations following the VIM-QLM/Central proof of concept with the QLM-Client/Sever system previously implemented at US Marines Corps' San Diego Recruit Training Center.

2.2   Scope of the Project

The scope of this project required Project Team members to coordinate several different tasks and activities. The initial activity included the conduct of analysis and definition of the server and MILSTRIP interfaces between ACIIPS and QLM/Local with TRADOC and FLW. Tailoring of system software, testing, and implementation of the QLM/Central and QLM/Local systems to mirror ACIIPS' MILSTRIP transactions at the FLW CIIP followed this.

The systems required programming to transfer mirrored MILSTRIP data from the ACIIPS at FLW to VIM-QLM/Central and back to QLM/Local-FLW for DSCP and Local Item Managers to collaborate on the management of DSCP-owned stocks through the VIM-QLM/Central common user interface. To accomplish this, MILSTRIP data from ACIIPS and QLM/Local-FLW is transmitted via the ARN AAVS DataMart to the project contractor AdvanTech, Inc., for asset visibility, decision support, and inventory management.

The QLM/Local Server hardware and systems software (i.e., the Windows NT Operating System) were provided by DSCP. The contracts to establish communication linkages for QLM/Local were handled by AdvanTech, and the Project Team subsequently oversaw the installation and training in the use of the Internet Service Provider (ISP) software and communication capabilities to transfer information to QLM/Central via file transfer protocols (ftp). After initial development and testing, QLM Local was moved to operational status at Ft. Leonard Wood.

The Project Team followed development of the initial system design requirements with implementation and "go-live" support. This activity provided essential support for the construction of all data tables and data conversion necessary to obtain issue information from ACIIPS. Initially, the data transferred from the ACIIPS at FLW was maintained in a "stockroom" of the QLM/Central "Lite" application system at AdvanTech. This was specifically set up to permit AdvanTech and designated Item Managers to manage the DSCP-owned stock at FLW until the function was transferred to VIM-QLM/Central.

Subsequent to implementation and go-live, the AdvanTech and EDII Project Team provided support for system operation and management support. During the construction of VIM-QLM/Central, there was a period of time when the system was operational based on the use of the VIM-QLM/Central "Lite" capabilities. During this time, AdvanTech provided system operational and management support to the DSCP and Wholesale Local Item Managers, providing recommendations for QLM/Local operations and routine

inventory support. These activities required close collaboration with personnel at DSCP as well as on-going and frequent communication with personnel at FLW.

Throughout the project, AdvanTech and EDII provided routine reports and project status updates. Status reports were routinely provided on a monthly basis by email and hard copy. Monthly Interim Progress Reports (IPRs) were prepared and provided. This document is the Final Technical Report.

2.3 Short Term Project Objectives

The objectives of this STP as contained in the original project proposal and used for the project work plan included:

- Implement QLM/Local to mirror ACIIPS' MILSTRIP transactions at the FLW Clothing Initial Issue Point (CIIP). Upon implementation of QLM/Local, the system was to be used immediately to start making decision support recommendations based on ACIIPS issue input.

- Essential order and inventory management information was to be transmitted from ACCIPS and QLM/Local to VIM-QLM/Central via ASCOT, SAMMS and the AAVS DataMart, with VIM providing the common data and user interface.

- The overall objective was to provide the DSCP Item Managers, through the VIM-QLM/Central system functions, the information they needed to manage and control DSCP-owned inventory at the FLW RTC.

The following sections present the specific objectives of different stakeholders based on formal guidance and discussions. These objectives guided the ARN Team's investigation, development of evaluation criteria, and analysis of alternate courses of action.

2.3.1 Ft. Leonard Wood Objectives

The mission of Fort Leonard Wood's (FLW) Clothing Initial Issue Point (CIIP) is to deliver the highest quality, best fitting clothing to their soldiers ("war fighters"). They must have complete issue stocked and ready to support the training center's mission and to avoid (at all costs) going out-of-stock on any item.

The following objectives were gathered during initial discussions with Ft. Leonard Wood personnel. These were reviewed at the summary out-briefing presentation provided at the conclusion of the initial site visit.

- Transfer Inventory Accountability
  - Issue All Clothing on First Recruit Pass
  - Obtain Predictable, Consistent Replenishment Support

- Maintain High Level of Operational Quality:
  - More items at Mechanicsburg or Alternate Depot
  - More Bill & Hold
  - Less Quick Response
  - Timely Transaction Postings
  - Data Reliability

- Achieve Improvements
  - Obtain Efficient Visibility of Requisition Transactions
  - Reduce Time Required for Daily Reconciliations
  - Consolidate Operations & Reduce Space

- Implement State-of-the-art Systems and Procedures
  - Equipment
  - Technology
  - Management Practices

2.3.2 TRADOC Objectives

The following objectives were based on previous discussions with TRADOC personnel and from comments gathered during the Project review activities at Ft. Leonard Wood.

- Implement ACIIPS-R (concurrent with development of QLM/Local)
- Obtain Predictable, Consistent Support
- Reduce Space and Consolidate Base Operations
- Increase Operational Efficiency
- Explore Alternative Inventory Management Processes
- Optimize Support to War Fighters
- Lower Inventory Costs
- Interface with Army Legacy Systems
- Changes recommended should not affect military staffing, i.e., no reductions-in-force

2.3.3 DSCP Objectives

The following objectives were the ARN Team's understanding of the objectives of DSCP based on previous input and discussions during the on-site review activities.

- Assist Army in Reducing Inventory Investment Through DLA Inventory Ownership, Automation, & Modern Replenishment Practices
- Design New Processes for Efficient Roll-Out to Other Sites
- Prove New Designs at Ft. Leonard Wood

2.3.4 DLA Objectives

The following objectives are based on the statement of work for the project support and incorporate insights from previous discussions and input received from DLA project management.

- Implement and Demonstrate ARN Concepts to Reduce Total Supply Chain Inventories including:
  - Total Asset Visibility
  - Full Automation
  - Balanced Flow

- Prove Concept & Processes for Effective Transfer to Other RTCs

All of these objectives as stated in 2.3.1 to 2.3.4 have been met and ACIIPS/R, QLM/Local and VIM-QLM/Local Central are functioning today as an integrated system. The over arching project objectives of Total Asset Visibility and automation of supple/inventory replenishment at FLW using QLM/Local and VIM-QLM/Central have been met. The effectiveness of the system functionality has been proven and the rollout to other RTCs and their CIIPs has been affected.

2.4 Definition of Terms

"Wholesale Local" inventory. The inventory of an RTC combined with the RTC bulk or DCSP bulk inventory that is co-located, or in close proximity, and *owned by DSCP*.

DOS: Required quantity for a day (higher level of granularity, e.g., at the PGC level) – Required quantity of the right item of the right size for a day, e.g., PGC+Tariff at the NSN Level and DOS is expressed in units (quantity).

Two definitions for Days of Supply:

- Retail DOS or RDOS

- Annual Wholesale DOS or ADOS

Computation of RDOS is based on data provided to the AAVS Data Mart for the RTC:

- Number of Recruits on a weekly basis (based on Accession Plan)

- Tariff for the RTC

- Using these two items, BIFRS-W algorithms are used to compute the annualized DOS. By performing the computation in a "central" location as opposed to the individual RTCs, any changes to the computation algorithm can be easily implemented.

Computation of ADOS is based on two components:

- Predicted data for RTCs

- Historical data based on past sales for other (non-RTC) sales in the respective military service including all military sales for items used by the RTCs, so that usage on "common items" is captured.

- Both data items will come from AAVS and be used by BIFRS-W algorithms for computing WDOS with BIFRS-W algorithms used in calculating the ADOS for individual RTCs.

3.0 SYSTEM ARCHITECTURE & OPERATIONS

3.1 Overview of System Architecture

The overall focus of the ARN Asset Visibility System (AAVS) and AAVS DataMart is on the collection of data in a shared repository for use by the Item Managers at the retail (Base CIIPs) and wholesale (DSCP) levels. The systems incorporated in this integrated approach are designed to provide all users with clear visibility of all recruit clothing assets throughout all segments of the supply chain. Further, the systems extract operational data from the Clothing & Textile (C&T) server and use this information as the basis for supporting decisions by the Item Managers for supporting operational needs. Thus, the Virtual Item Manager (VIM) system incorporates the decision support capabilities of QLM/Central for wholesale inventory management requirements.

In the efforts that have been accomplished to-date, VIM-QLM/Central provides an independent network of servers linking C&T SAMMS, AAVS DataMart and QLM/Locals into an integrated system for recommending relocation of uniform items from "depots" to the supported recruit training centers. To create this integrated systems approach, the base QLM-Client/Server was modified to use data from the AAVS DataMart for decision support and management of inventory in the supply chain.

A web-based interface with the Virtual Item Manager was incorporated in VIM-QLM/Central. VIM was developed to provide a common user interface for Item Managers to use to manage the supply chain using inventory data flowing from the retail and wholesale levels to the AAVS DataMart and VIM-QLM/Central. The Virtual Item Manager (VIM) as it is being developed uses a combination of computer and web-based software that provides Item Managers with the supply chain and inventory information necessary to expedite distribution of assets.

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3.2 General Concept of Operations

In preparation for transfer of ownership of recruit clothing assets at Ft. Leonard Wood (FLW) to DSCP, AdvanTech implemented the Quality Logistics Management (QLM)

system. The purpose of the QLM/Local system is to provide restock recommendations based on RTC projections of the numbers of recruits to be trained/processed through the CIIP, and the actual clothing issues information provided by the Army Clothing Initial Issue Point System (ACIIPS). System relationships and data flows are illustrated in Figure 2.

Concurrent with the transfer of inventory assets to DSCP ownership, the FLW stock location was designated as a new DSCP RIC (Routing Identifier Code) or Depot. The FLW transactions are sent via file transfer protocol (ftp) to QLM/Central at AdvanTech. QLM/Central then processes the ACIIPS issue information, adjusting the quantities of individual NSNs available for issue, generating replenishment requirements, and manages the local inventories. Issues, Receipts, Adjustments, and Redistribution Requests are transmitted into SAMMS via the Clothing & Textiles (C&T) Ascot Server daily from QLM/Central.
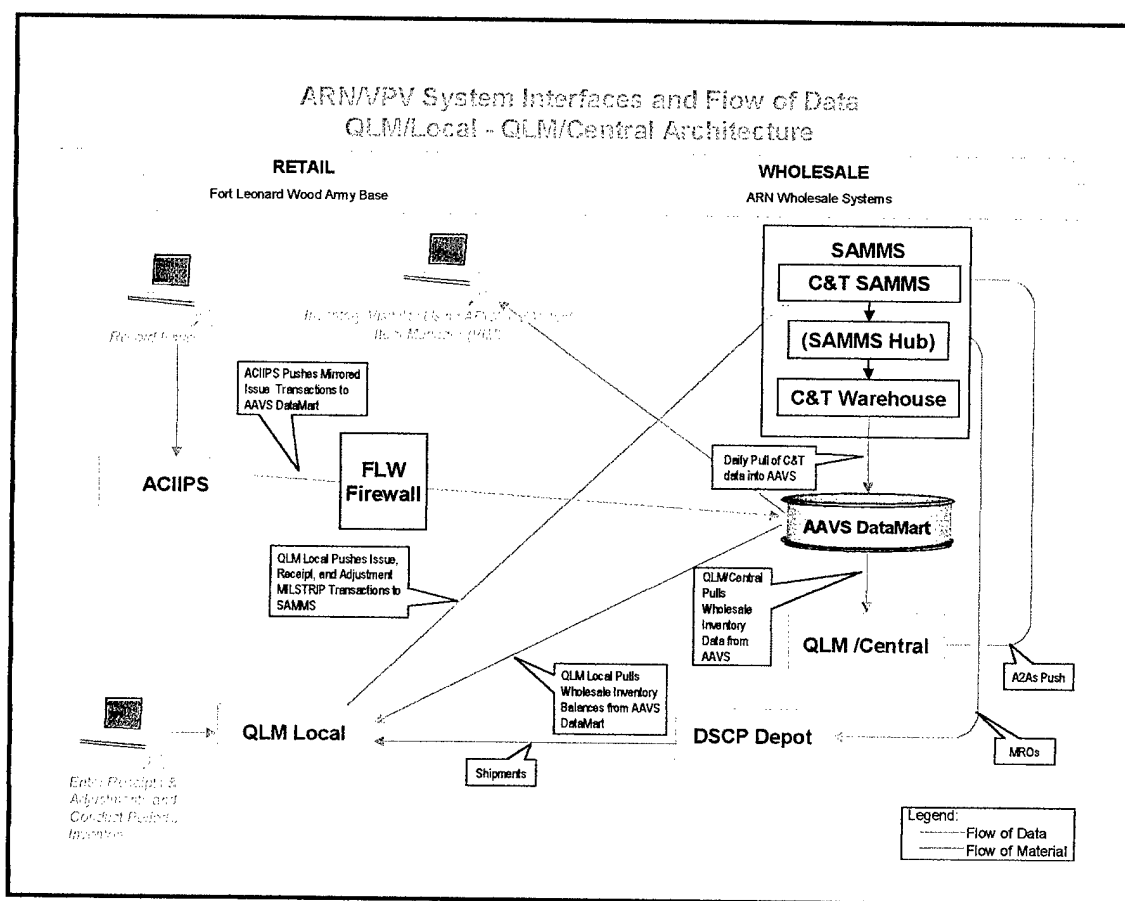
Figure 2 – ARN/VPV System Interfaces & Data Flows

This approach, as illustrated above in Figure 2, shows that there is no interference with the FLW Clothing Initial Issue Point (CIIP) and ACIIPS operation, and minimal impact on current system operation and resources. The objective was to make the transfer of asset ownership with inventory replenishment responsibilities to DSCP and

implementation of QLM/Local and QLM/Central as transparent as possible to the CIIP and to ACIIPS. As designed, QLM/Central pulls wholesale inventory stock levels from AAVS DataMart to determine ship-points (depots or bill & hold locations) for the redistribution requests.

QLM/Local operates outside the FLW firewall, and does not require access to the FLW local area network (LAN) or the campus area network (CAN). The CIIP procedures have remained the same, with the addition of periodic inventory using handheld terminals and the entry of receipts and adjustments directly into QLM/Local. A DSCP-sponsored telephone line is being used for QLM/Central to gather all inventory data and transactions from QLM/Local. As a result of implementing this operational scenario, there was no need for access to the FLW LAN and CAN.

CIIP personnel have full visibility of DSCP's wholesale inventory at FLW. This is provided through the Virtual Item Manager (VIM) Internet browsing capability into the Apparel Asset Visibility System (AAVS) DataMart, an Apparel Research Network (ARN) initiative now in prototype. Finally, AdvanTech uses a dial-up telephone line to QLM/Local for the purpose of system software maintenance.

4.0 FT. LEONARD WOOD CIIP OPERATIONS

This section provides a brief overview of the CIIP operations at Ft. Leonard Wood. It includes a summary description of each of the processing activities and issue stations that a new recruit passes through during the initial training programs. The original project report provides a comprehensive description of each of these processing activities. (See the ARN Web Site for all related project reports.)

4.1 The Ft. Leonard Wood RTC Training Cycle

At Ft. Leonard Wood, as at the other CIIPs operated by TRADOC, the entire basic training cycle is a short 8-week period. Because training activities are tightly scheduled, there is no time for a soldier to wait until they can get a critical part of his/her initial issue. The training schedule for the new soldiers is very strict time from the point of departure (MEPPS Station) to Basic Training Center (BTC) to their Advanced Individual Training (AIT).

According to a FLW representative, a large percentage of the females going through the training cycle do not pass weapons qualification before the 5th week of the cycle when Phase II issue is distributed. This issue can cause major difficulties between the Automated Clothing Initial Issue Point (ACIIP) system and the military units and is an area that has to be considered in developing and implementing automated solutions for inventory management and replenishment using predictive forecasting.

4.2 Areas and Functions Reviewed

The ARN Team reviewed all of the elements of the Clothing Initial Issue Point operations in support of Recruit Training Center activities during the initial site visit as noted. This review was critical to insure thorough understanding of current operations including how the Army's single stock fund would be implemented. In addition, the review provided a sound basis for evaluating alternatives that ultimately led to the selection of the use of QLM/Local and QLM/Central to support the transfer of asset ownership to DSCP and to manage the uniform assets as a wholesale local inventory.

4.2.1 Clothing Inventory Organization and Flows

The clothing issue for the new recruits going through training is warehoused in 3 buildings: 1) the Phase I warehouse (red brick); 2) Building 2320 for Male Phase II Issue; and 3) Building 2323 for Female Phase II Issue. In addition to warehousing for the bulk inventory, the Male Phase II Issue activity is located in Building 2322 and Female Phase II Issue activity is located in Building 2324.

Alterations are done in the Phase I warehouse for male/female Phase I Issues, and in Building 2321 for Phase II Male, and 2324 for Phase II Female issues.

4.2.2 Replenishment, Receiving and Warehousing Operations

At the time of the initial site visit by the ARN Project Team, inventory stockage levels had been revised to reduce inventory as part of preliminary planning for the implementation of the Army's single stock fund. Also, DSCP had been managing routine replenishment and improved service levels by using a dedicated truck from Mechanicsburg Depot. This enhanced distribution support was providing an estimated 10-day reduction in order-ship time (OST). All stock that is received is processed centrally and then moved to the appropriate storage location.

Prior to implementing QLM/Local, FLW was replenishing inventory every day with material requisitions processed through CTAS to SARSS to DASC. This process did not change substantially following implementation of the new systems and transfer of asset ownership to DSCP.

During the initial site visit, review of current operations resulted in the observation that it would be very difficult to separate the bulk "warehouse" inventory from the stock in the issue line. As a result, DSCP determined that the transfer of assets would include all inventory rather than trying to devise a method for operations with the "phase line" inventory handled separately and owned by the Recruit Training Center.

4.3 Phase Line Issue Processes

As part of the planning for the implementation of QLM/Local at Ft. Leonard Wood, it was necessary to understand the current operations and related procedures for operational support. This section provides an overview of the recruit processing and related issue activities.

4.3.1 Phase Lines

Ft. Leonard Wood (FLW) has three clothing issue lines. Phase I is located in the recruit reception processing building and consists of all PT clothing, underwear, and field clothing. Both males and females use the same issue line, but at different times. Phase II is located in a different area a short drive from Phase I and consists of all dress clothing.

There are two Phase II lines in adjacent buildings, one for males and one for females. Males and females are processed at different times so the same Phase II fitters can operate both lines.

Each of the Phase lines has multiple issue stations. These stations allow for the recruits to be processed through issuance of individual uniform items in a sequential manner.

4.3.2   Issue Stations

Each issue line is broken down into stations with one or more garments per station. A counter separates the recruits from the issue bins. Fitters check the fit of their items at the end of their issue stations. Some stations have special fitting platforms as required.

4.3.3   Fitters

There are permanently assigned civilians overseeing operations on each of the phase lines. Their primary responsibility is to ensure the recruits passing through each station are properly fitted. One civilian fitter is responsible for everything within his or her station. Each fitter fits recruits sequentially in small groups and handles all miscellaneous transactions. They accurately determine the size garment for the recruit, pick the garment from the issue line behind the counter, and have the recruit try the garment on for proper size. They then carefully check the fit, select other sizes if required, and mark for alterations as required. Finally they record the size garment actually issued on the Clothing Worksheet.

Fitters are also responsible for restocking their issue lines as required. This is done mostly at the end of the day after issues are completed, but is also done periodically as workload permits during the day. No paperwork is required or processed for restocking. They also process other transactions such as zero lists, exchanges, and replacements. Finally, they readily perform other functions such as sewing and assisting other fitters to eliminate bottlenecks in the issue process.

4.3.4   Recruit Labor

Recruits are used to assist with labor tasks such as moving issued items from one processing station to another and cleaning up hangers, boxes, etc. They are not used in any critical issue or restocking processes.

4.4   Phase I Issue Process

In the Phase I Recruit Processing Center, each soldier is issued all clothing needed for weeks 1-5 of his or her respective training cycle. The soldiers are held in the nearby

reception station for 4 days where they undergo administrative processing. Uniform issue is one of the first stops, just after haircuts.

4.4.1 Planning/Preparation for Recruit Processing

Recruits arrive on day 2 of their 4-day induction processing cycle. The Clothing Initial Issue Point (CIIP) Supervisor receives three (3) reports each day that they use to prepare for the arrival of the recruits. These include:

- **Daily Expected Recruit Forecast** – This report shows the number of recruits that arrived by week for the past and current quarters, the forecasted arrivals by day for the next 30 days, and the forecast by week for the next 4 quarters. It is in spreadsheet format and is used to plan short and long-term workloads on the issue line.

- **Hotel Roster Report** – This is a daily report listing all the recruit information required for the Phase I issue. It is received on Day 1 prior to the arrival of the recruits on Day 2. Key data includes the roster number, line number, name, SSN, Component, and sex.

- **Clothing Worksheet** – A clothing worksheet, TRADOC Form 248-R dated Dec 83 is provided for each recruit. A label with key recruit information is attached to each worksheet. The form is preprinted with a line for each item to be issued and there are columns for actual quantities and sizes issued. This line number is a key within ACIIP and is the equivalent to DSCP's procurement group code or PGC.

Before the new recruits arrive, the roster is used to make the name tapes and plates and is input into ACIIP for subsequent issue processing. Kits of belts, buckles, and other non-sized items are placed in recycled plastic bags with recruit labor to prepare for processing new recruits.

4.4.2 Initial Recruit CIIP Processing

The recruits are processed through several stations in the CIIPs to receive their uniform allotment (bag items). The initial station provides for orientation for the new recruits and includes issuance of kited items and laundry bags. Other stations for the issuance of PT clothing, BDU trousers, BDU coats, cold weather coats and related items, underwear and towels, and combat boots follow this orientation station sequentially.

Following processing through each of the issuance stations, recruits stop at the "accounting" station where worksheets recording the Phase I issues are keyed into

ACIIPS. This information includes the recruit line number, and the data entry clerk verifies the ACIIPS quantity authorized and issued, including sizes and shortages.

The Supervisor later double checks the worksheets against the "Clothing Record" and corrects any errors. If errors are discovered, new Clothing Records are generated and distributed. At the end of the day, the Supervisor runs the daily ACIIPS closure process.

4.5   Phase II Recruit CIIP Issue Processing

Following completion of Phase I training, recruits return to the CIIP in week five of training for the second issue of bag items. Again they are processed through several stations in the CIIP to receive their uniform allotment. These include shoes, gloves, short sleeve shirts, slacks or skirts, coats, overcoats and caps.

During the issue activities, nametags are attached for alterations/pressing. Alteration requirements on slacks, skirts and other items are also marked and items tagged for identification and processing during Phase II issue activities. Alterations are generally completed within five days.

As in Phase I, the last station is for accounting of the issues. Recruits wait in orientation room until computer generated Clothing Records are ready to sign.

4.6   Other Issue and Exchange Activities

There are several other activities that occur at the CIIP related to uniform issue activities that must be recorded and properly accounted for during ACIIPS processing. These include turn-ins, exchanges, and special order processing.

4.6.1   Clothing Turn-in Process

These occur when a recruit does not complete training. All turn-ins are received at the CIF's Clothing Reclamation Facility (CRF). New or like-new items are sent to the CIIP for reissue. The CRF collects garments in laundry baskets by style and prepares a DA 2765 with one valid NSN for the turn in of all garments of the same style. Items are then transferred to the CIIP.

The CIIP validates the count and segregates by size. They then record the size and quantity on a local form and attach it to the DA 2765.

The Phase Line supervisor keys in the turn-in by item and size, generates a printout, and attaches a turn-in printout to the 2765 and detailed list for audit trail purposes.

4.6.2 Clothing Exchange & Replacement Process

Recruits are permitted to exchange like items in order to get the proper fitting garment. A locally produced "Clothing Exchange Worksheet" is completed by the fitter and used by the Supervisor to correct the ACIIPS balance.

The unit commander authorizes clothing replacement on a DA Form 3078, Personal Clothing Request. The recruit presents the form to the fitter who verifies the need, collects the old item, and issues a replacement. The fitter completes the form by entering the size and quantity issued.

The supervisor keys the transaction into ACIIP from the 3078 to deduct the assets from the inventory, prints a copy of the transaction, and files a copy of each document for an audit trail.

4.6.3 Special Measurement Process

Generally the CIIPs – including Ft. Leonard Wood – have very few SM orders with almost none coming from Phase I. When there is a need for a special measurement process and the fitter takes the measurements, completes the manual paperwork, and forwards it for data entry.

4.6.4 Quality Deficiency Reports

Quality Deficiency Reports (QDRs) are completed for items with quality problems. The items are held in special locations for each Phase Line and processed according to established QDR policies and procedures.

5.0 IMPLEMENTATION OF QLM/LOCAL
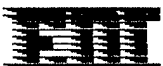
This section provides detailed information on the activities related to the implementation of QLM/Local at Ft. Leonard Wood, the conversion of the QLM/Retail programs to support "wholesale local" inventory operations, and the lessons learned in the process. Information is also provided on the current operations of the integrated systems supporting operations today at Ft. Leonard Wood.

5.1 Implementation Schedule for QLM/Local

The QLM/Local at Ft. Leonard Wood implementation activities were initiated in August 1999 with initial focus of activities being on finalizing the prototype system architecture. The following figure (Figure 3) provides a graphic representation of the timeline for the activities related to the system implementation at Ft. Leonard Wood. As shown, the left hand side of the graphic illustrates the systems activities related to software programming, installation and training. The right hand side illustrates the related logistics support activities that were performed on a concurrent basis. T-0 was on 25 January 2000 with implementation activities started 12 weeks earlier (T-12). By April 2000 the system had been successfully implemented and was operating smoothly.

Figure 3 – QLM/Local Installation Timeline

5.1.1 QLM/Local System Implementation Activities

As shown in the timeline for systems activities, the key steps are clustered in site preparation activities, go-live, and QLM/Local operations. Following the initial site survey, the recommendations for the site were prepared and approved, and the hardware/software prepared (hot staged), shipped and installed. The QLM/Local server was physically installed in a location determined to be suitable for access for the required tasks. This was in the office of the Ft. Leonard Wood Supply Manager's designated assistant responsible for local operational support. This individual is responsible for entering receipts and adjustments into QLM/Local and for transferring ACIIPS issues data.

Testing of the system software then followed these initial steps. Since this was the first site for implementation of QLM/Local, the system interfaces were tested to ensure that data was being transferred accurately and according to schedule. This included transfer of issues data from ACIIPS to QLM/Central as well as the data transfers from QLM/Local to VIM-QLM/Central "Lite" and the AAVS DataMart.

Concurrent with the installation and testing activities, personnel at Ft. Leonard Wood were provided with limited initial training related to how the QLM/Local system was designed to provide support along with changes in the use of the ACIIPS to process daily issues. This initial training provided an essential understanding of system operation and functions. More advanced training for user personnel was provided on subsequent visits as part of the Phase II just prior to and during go-live activities.

Prior to go-live, personnel initiated the daily flow of FLW supply chain data to the AAVS DataMart and VIM-QLM/Central "Lite" and implemented the daily supply management processes set forth in the operating procedures. In effect, there were no parallel operations, and QLM/Central "Lite" was used to process redistribution recommendations from day one.

The next critical step in the process was to test the management of DSCP-owned stock at Ft. Leonard Wood with ACIIPS and QLM/Local for one month. During this period, the supply chain management results of VIM-QLM/Central "Lite" and ACIIPS were carefully monitored each day to ensure there were no significant problems with supply replenishment to meet recruit clothing requirements.

AdvanTech personnel returned to Ft. Leonard Wood to provide Phase 3 Training during 17-20 April 2000. At this time, the focus was on close monitoring of operations, providing additional training in the new methods and procedures and building closer working relationships between DSCP, TRADOC, and CIIP personnel in managing inventories that had been converted to "wholesale local" status.

5.1.2   Concurrent Supporting Logistics Activities

At the same time the QLM/Local system implementation activities were occurring, there were other logistics activities being accomplished as shown in Figure 3 – QLM/Local Installation Timeline. The initial activities included collection of the ongoing issues data recorded in the Ft. Leonard Wood ACCIPS for the three months preceding the planned go-live date. This information was carefully analyzed as part of the process of data table build and data conversion in preparation for system activation.

In the last three months before the go-live process (See Figure 3 – T-12 to T-0 covered November 1999 – January 2000), the Ft. Leonard Wood personnel worked with TRADOC to transfer the daily issues to AdvanTech for processing in the planned QLM/Local system. This information was also used in testing the conversion and modification of programs in the development of VIM-QLM/Central "Lite."

At Ft. Leonard Wood, preparations were under way as well. Activities there included preparation for the final physical inventory to be completed as part of the system cutover. These actions were related to getting ready for completing the physical inventory and uploading data on inventory on hand at the time of transfer of inventory accountability from Ft. Leonard Wood ownership to DSCP ownership.

QLM/Central used the issues information that was being provided on a daily basis from ACIIPS to take over inventory replenishment activities. This allowed most of the existing dues-in that had been created by ACIIPS to be received into ACIIPS prior to go-live conversion and for the orders created by QLM/Central "Lite" to be received into QLM/Local after the conversion and go-live had been accomplished.

5.2   Data Architecture and Data Flows

A key task during the early stages of project support was the focus on finalizing data flow requirements and establishing and procuring the final hardware configuration. As part of the data flow requirements, AdvanTech and EDII worked closely with DSCP and TRADOC personnel to refine the necessary data inputs, wholesale MILSTRIP formats required, and other modifications to the QLM/Retail system capabilities necessary to support QLM/Local operational requirements.

AdvanTech's goal was to obtain the needed data from ACIIPS with a minimum of programmer involvements from TRADOC. Following the identification of essential data elements, the draft system architecture, the data flows, and the layouts for the initial data requirements for the transactions coming from ACIIPS were presented for discussion and approval for final programming modifications. The initial format requested included the

from the CIIP to the AAVS DataMart. To accomplish this, TRADOC established the programs and scripts to handle "pushing" the issues data through the ARMY firewall to an FTP site maintained by Product Data Integration & Technology (PDIT). This was accomplished through coordination of needs between AdvanTech and PDIT.

5.3 Program Conversion & Modification Activities

The final design and programs provided for data transfer between ACIIPS and QLM/Local to ASCOT and VIM-QLM/Central. As implemented, the data is "pushed" from the CIIP (Ft. Leonard Wood) into QLM/Local via the AAVS DataMart. The links go from ACIIPS to QLM/Local, QLM/Local to QLM/Central-Lite (the interim system used during the completion of VIM-QLM/Central), QML/Central-Lite to SAMMS, and from the AAVS DataMart to QLM/Central-Lite.

5.3.1 Conversion of QLM/Retail to QLM/Local

Concurrent with the finalization of the data flows and system architecture, AdvanTech worked on converting the QLM/Retail system for QLM/Local. The primary effort for this conversion was to change the MILSTRIP formats from the Retail documents to the required Wholesale formats. AdvanTech also compiled and maintained a cross-reference list of MILSTRIP Documents during this process to ensure all record types were accounted for in the final programs developed and fielded.

AdvanTech modified QLM/Local functionality to generate a separate text file of the daily A0A MILSTRIP transactions. This file subsequently is pushed via FTP to TRADOC and converted into T23 Obligation MILSTRIP transactions and then forwarded to the Army's STANFINS (Standard Financial System) for processing financial obligations. This ensures the monthly DSCP bill is properly matched to the associated document numbers following processing of the daily recruit issues received from ACIIPS.

While not directly related to QLM/Local implementation activities, it should be noted that plans call for future replacement of STANFINS (Standard Financial Management System) with the SARSS (Supply Army Retail Supply System) and STARFIARS MOD (Standard Financial Inventory Accounts and Reporting System – Modified). SARSS was initially installed in June 1998. STANFINS is still in use, but plans call for this legacy system to be completely replaced by the

item stock number (National Stock Number - NSN), date of issue, quantity issued, and account number. A related financial issue for consideration during these discussions was the Army's elimination of the stock fund accounts. These issues were handled and resolved between DSCP and TRADOC.

An additional issue that was addressed during the project was the provision of issue data

STARFIARS-M. The primary interface is from ACIIPS to SARSS for requisitions, receipts, and billing transactions. SARSS in turn transfers financial information to STANFINS/STARFIARS-M for general ledger financial reporting.

AdvanTech also modified QLM/Local functionality to generate a separate text file of the daily D6K receipt MILSTRIP transactions. As implemented this file is pushed via FTP by QLM/Central-Lite to C&T SAMMS to record the receipt of items into the appropriate existing dues-in records. Another requirement was the program conversion of QLM/Retail record structures for MILSTRIP formats for inventory adjustments (D8A and D9A).

5.3.2   TRADOC Program Modifications

Concurrent with the modifications to the QLM /Retail programs to support the QLM/Local implementation at Ft. Leonard Wood, TRADOC was working on programming the automated function for Ft. Leonard Wood and subsequent CIIPs to push the daily issues through the base firewall to the QLM/Central-Lite and the AAVS DataMart. This activity was completed in the spring of 2000 and tested at the same time the other program modifications were being programmed.

5.3.3   VIM-QLM/Central Operations Modifications

Following the completion of the activities required to make the QLM/Central server operational, QLM/Central-Lite was re-configured and connected to the Internet via the DSL phone lines in the AdvanTech offices in Annapolis. Once these steps were completed, the web page showing the daily Suggested Order List was finalized and linked from the VIM-QLM/Central screen providing DSCP personnel with the ability to have notification of the Ft. Leonard Wood Suggested Order List. With this in place, it was then possible for all Item Managers at DSCP to be able to view this information every morning before the data was passed from QLM/Central-Lite to C&T SAMMS.

5.3.4   QLM/Local Documentation

During the programming modifications, AdvanTech also modified and re-wrote the procedures for the daily operation of the QLM/Local-ACIIP configuration at Ft. Leonard Wood, and for the daily operation of the VIM-QLM/Central "Lite" at AdvanTech. The procedures were written to ensure the integrity of the daily data transfer cycles, and that the management of the Ft. Leonard Wood supply chain/supply replenishment activities would be performed in a consistent, structured manner each day.

Following completion of the rewrite of the manuals, the QLM/Local User Manual was distributed as part of the training and system implementation activities at Ft. Leonard Wood.

5.4 Highlights of Implementation Activities

Throughout the project, monthly reports were provided to the personnel at Ft. Leonard Wood as well as regular reports to Project Management. These reports detailed activities, problems, solutions and successes at Fort Leonard Wood and the following are highlights from the interim progress, technical and trip reports.

In August and September 1999, the efforts of the project team were on the completion of the system architecture design and data flows. These efforts were completed in collaboration with DSCP and TRADOC personnel. As the project moved forward, a compiled list of MILSTRIP document type was forwarded to DSCP for review and to ensure the current record formats were used for programming requirements.

During the October 1999, AdvanTech and DSCP personnel traveled to Ft. Leonard Wood to complete hardware installation and discuss implementation plans with CIIP personnel. In the process of completing initial on-site hardware testing, it was determined that the modem was faulty and had to be taken back to AdvanTech for replacement. This was accomplished in early November and the equipment returned to Ft. Leonard Wood, installed and tested and determined to be functioning properly. AdvanTech accomplished this by accessing the hardware and QLM/Local programs via PC/Anywhere software used for remote diagnostics and training support.

Also in October, AdvanTech evaluated support options and selected an Internet Service Provider (ISP) for remote file transfer operations and support. AdvanTech then initiated service with the ISP selected, Fidelity Networks (www.fidnet.com). Once service was established, AdvanTech worked with TRADOC to begin testing of the ACIIPS transfer of the issues data via FTP. An initial test functioned, but disclosed some problems with the Ft. Leonard Wood personnel performing the FTP processing within its Windows based systems. Ultimately these problems were resolved and daily transfers of CIIPs issues were accomplished as designed.

At the close of October, the actual implementation of QLM/Local and the transfer of the inventory to DSCP were on hold pending the final resolution of issues related to the inventory Cap/De-cap (capitalization/de-capitalization) resolution between DSCP and the ARMY. This resulted in moving the "go-live" date to 29 November 1999. The Cap/De-cap issue was still not resolved at the end of November, as well as some additional financial issues related to the Army's move to the single stock fund. This resulted in a second delay in activating QLM/Local and VIM-QLM/Central-Lite. A subsequent decision was made to move the go-live date to 25 January 2000.

5.5 QLM/Local Implementation Issues at Ft. Leonard Wood

During the project there were several items that were identified as issues that had to be resolved prior to moving forward with project completion. These issues are described briefly in the following material.

5.5.1 Issues Data visibility in the AAVS DataMart

In the early stages of project support, Project Management determined that the AAVS DataMart needed visibility of the issues data from Ft. Leonard Wood. This was resolved by having QLM/Central-Lite initially "pushing" this data to the AAVS DataMart. AdvanTech worked with PDIT to specify an FTP location for this data and scheduled this to be done as part of routine processing.

5.5.2 Integration of DSCP/SAMMS Information Systems Requirements

AdvanTech worked with DSCP personnel to coordinate integration of ACIIPS issue information with existing SAMMS data. Specific requirements included: 1) Establishing a new DODAAC and RIC for Ft. Leonard Wood Wholesale Local Inventory; and, 2) Linking QLM/Local activation to data becoming visible in the NIR2 table.

5.5.3 FTP File Transfers via the Internet

The transfer of clothing issues and information on stock status and receipts processed was a founding principle of developing the new capabilities using the VIM-QLM/Central support to manage the wholesale local inventories. The early installation and testing of these FTP capabilities were problematic with sporadic successes. Ultimately, a new phone line was installed, a different ISP selected and additional programming changes developed and incorporated before satisfactory and reliable results were achieved.

Part of the issue was that the ISP would disconnect after 20 minutes during the file transfer process because the ISP capabilities did not recognize the data transfer as an active connection. This resulted in significant frustration for the project team but did not hinder daily operations other than requiring additional time for processing. This issue ultimately was resolved during the Phase 3 Training provided in April 2000.

5.5.4   Returns and Exchange of Items

During the early stages of system development and implementation, it was determined that another automated function that needed to be designed was for processing returns of Condition Code "A" items and exchanges of Condition Code "A" items. This was because there are routinely new recruits who are either issued the wrong sizes and must exchange them for properly fitting uniforms, and there are also recruits that "wash out" during the training process and return their items for use by other new recruits.

In both cases, these are items that were issued but not used by the new recruits and are therefore new items that can be returned to stock for reissue. At the time of this report, concurrence on the need for program and operational modifications had been achieved between the DSCP Business Office personnel and TRADOC and programming modifications were in process.

5.6   Conversion & QLM/Local Go-Live

Throughout the project, there were numerous issues and difficulties that had to be resolved. A major delay in the early stages of the project was the resolution of the Cap/De-cap issues and the difficulties with the FTP data transfer over the Internet reliably. Following completion of the program modifications, conversion and testing, QLM/Local went live.

Upon installation of QLM/Local to manage the "wholesale local" inventory, it became obvious that it was not realistic, nor possible to run parallel with a "mirrored" operation. From day one, QLM/Central made reorder/relocation recommendations with careful review and coordination between AdvanTech, DSCP and Ft. Leonard Wood personnel. This coordination was essential in the early successes that were achieved and minimized difficulties associated with the cutover to the new systems and procedures.

5.6.1   Initial QLM/Local Inventory Values

QLM/Local officially went live at Ft. Leonard Wood on 25 January 2000. The initial inventory level was $2,932,584.10 (equivalent to 31 annualized days of stock on hand). While the conversion to QLM/Local went smoothly, Ft. Leonard Wood personnel had allowed inventory levels to drop too low just prior to the conversion and QLM/Central-Lite had to generate redistributions for 93 items the prior week to minimize stock shortages at the CIIP.

In February, QLM/Local continued to operate smoothly at Fort Leonard Wood and the month end inventory value was $4,321,362.05 or about 56 annualized days of supply. As per the original plan, QLM/Central-Lite was using the reorder levels that were transferred over from ACIIPS-R at conversion. These levels

continued to be used until QLM/Central had accumulated 2 full months of usage data. At that time, QLM/Central began to automatically recalculate the reorder levels.

QLM/Local continued to operate smoothly at Fort Leonard Wood in March 2000. The month end inventory values remained stable and were monitored by DSCP and AdvanTech on a daily basis. The following section on Metrics provides detailed information on the performance levels during this period of time.

5.6.2 QLM/Local Receipt Processing

During the early weeks after the go-live, one of the questions that came up was the speed of processing of receipts into the new system. AdvanTech personnel extracted data from SAMMS and QLM/Local to determine the amount of time that followed receipt of the items at the base before Army personnel were entering the receipts into QLM/Local. The chart below shows how quickly the receipts were being entered into QLM/Local after the receipt occurred in February 2000 just after the system had become operational.

Number of Days to Enter Receipt	Receipts Processed	Percent of Total
0	73	42.44%
1	47	27.33%
2	0	0.00%
3	37	21.51%
4	12	6.98%
5	2	1.16%
6	1	0.58%
7	0	0.00%
8	0	0.00%
9	0	0.00%
10	0	0.00%
Total	**172**	**100.00%**

Table 1 – Ft. Leonard Wood Receipt Processing Analysis

5.7 Continuing Operations of ACIIPS/R and QLM/Local

Today, operations at the Ft. Leonard Wood CIIP are managed with an integrated approach using ACIIPS, QLM/Local and VIM-QLM/Central Operations. ACIIPS today continues to provide transaction registers of the daily issues to recruits and also several standard reports documenting financial transactions. The operational tables (databases) for ACIIPS are erased at the end of each month and only limited information is carried

forward. The reports available provide visibility to the Army for planning and budgeting purposes.

ACIIPS/R (the revised version of the ACIIPS software installed during 1999) provides daily and historical data on soldier issues with the CIIP personnel controlling the ACIIPS/R server. The contemporary issues information is reported on a daily basis and passed to AdvanTech at the FTP site for QLM/Central processing and transfer to SAMMS via the Clothing & Textile server ASCOAT.

ACIIPS/R also is used to maintain a dues-out file for soldier dues-out that are created when an item is not in stock and available for issue during recruit processing. The ACIIPS/R allows personnel to reprint the soldier clothing record and provides on-screen help.

QLM/Local provides the core functionality necessary to manage the "wholesale local" inventories. The local stockage levels are mirrored to QLM/Central with receipts and issues information merged from the integrated systems on a daily basis. Periodic inventories and spot checks have been implemented to ensure that the data from the different systems remains in synch and issues and receipts are being recorded properly.

VIM-QLM/Central now takes the ACIIPS Issues data provided by Ft. Leonard Wood and converts the aciipsissue.txt files into AOA data. This information is subsequently sent to Ft. Leonard Wood from the FTP site, and ACIIPS then converts the AOA data provided by VIM-QLM/Central into the required T23 format for transfer to STANFINS/DFAS for financial accounting and payment processing.

AdvanTech provides on-going support today for QLM/Local operational management with an experienced RTC Supply Manager. AdvanTech's staff performs monitoring and adjusting of stockage levels on daily basis with support and coordination to DSCP personnel. In this role, AdvanTech facilitates the activities of the Item Managers until the QLM/Local and VIM-QLM/Central systems are transferred to DSCP. In addition to working closely with DSCP, AdvanTech also regularly reviews system and supply chain assessments made by the RTC Supply Manager. AdvanTech then recommends/makes changes to system parameters and operating procedures to enhance the supply management process.

5.8 Lessons Learned During QLM/Local Implementation

As with any new system, there were numerous difficulties and issues encountered that had to be resolved as efforts progressed. The following items highlight the key lessons learned that needed to be considered for future ACIIPS – QQLM/Local conversion and rollout efforts.

5.8.1 Initial Code Set-up

DSCP must assure that all RIC, DODAAC, and any other required codes are created/assigned and operational prior to going live. This will minimize problems and will facilitate initial startup activities. AdvanTech compiled a list of essential discussion points and a checklist for use in implementation planning at subsequent sites (see Appendix).

5.8.2 Inventory Draw-down Levels

Future CIIPs involved in rollout and conversion from existing operations to "wholesale local" inventory should not reduce inventory to the "danger" level to meet capitalization/de-capitalization requirements. This will prevent unnecessary shortages and prevent/minimize expediting of inventory replenishment orders.

5.8.3 Shipping Plan/Predictive Forecasting Inventory Replenishment

Training needs to describe and emphasize the importance and impact of "order based on shipping plan" material flow including both management and warehouse personnel. This flow anticipates surges (predictive forecasting) and ships materials into the warehouse in anticipation of needs.

At the beginning of each month, the "shipping plan" information should be updated since it is used to generate the requirements for the month following the current month. At Ft. Leonard Wood, personnel indicated they extract information from RECBAS for shipping plan updates and make adjustments based on their personal knowledge of what they can expect to actually occur.

5.8.4 Physical Inventory Processes

Formal inventories were conducted semi-annually prior to conversion to "wholesale local" operations. Informal inventories are conducted when a fitter feels his inventory is getting too low or there is an unexpected stock out. These problems occur infrequently and are normally resolved quickly with the complete audit trails that are available. Both of these approaches – formal wall-wall and informal spot-checking or cycle counting – should be considered as routine procedures for other CIIPS if comparable processes are not already in place.

Under ACIIPS, different individuals made multiple counts until at least two counts match, and inventory control was tight with only ½ of 1% variance allowed on total dollar sales of $30,000,000 annually (allowable variances are one-half of one percent of sales each six months). Ft. Leonard Wood never had

any problem meeting this requirement in the past and did not anticipate any problems in the future with the new systems.

6.0 RESULTS ACHIEVED & METRICS

This section provides summary information on the results that have been achieved at Ft. Leonard wood to-date. It is important to note that the support has not ended with the completion of this project and that refinements continue to be made to fine-tune operational support and efficiency of the supply chain activities.

6.1 Operational Objectives & Results

There were several objectives defined at the start of the project. The desired results from new systems included the following:

- **Asset Visibility –**
  The ability for DSCP to efficiently see all data is required to meet ARN's objective to "see" on-hand inventory data regardless of the location at the RTC. This is the core functionality required as an essential aid to decision-making and has been successfully accomplished.

- **Legacy Interface –**
  The ability of the ARN solutions/software to work efficiently with existing external systems to meet current military department requirements was a key requirement, and has been successfully accomplished.

- **Current Information –**
  The ability of the proposed solution to provide access to current information on an as needed (i.e., timely) basis has been successfully accomplished.

- **Improve Operational Efficiency –**
  This criterion provides an estimate of the potential impact of the proposed solution to enhance the efficiency of Ft. Leonard Wood operations. This includes impacts on personnel support requirements for data collection, processing and materials handling activities. This has been successfully accomplished, and additional improvements including the use of automated data capture (bar code labels and hand held bar code scanners) capabilities are in process of being implemented in the follow-on support and maintenance activities.

- **Improve Effectiveness –**
  The potential impact of the proposed solution to have a favorable impact by supporting the management decision making process – both at Ft. Leonard Wood and DSCP, and this has been successfully accomplished. An example would be enabling minimum total inventory with lowest stock outs.

6.2   Inventory Management Metrics

The Fort Leonard Wood Basic Training Command processes in excess of 25,000 soldiers per-year. Of these, roughly 70% are male and 30% female. As at other Recruit Training Centers, the busiest period is summer (June, July, August) when 40% of the year's total troops are processed. The slowest time period is during the winter months, especially through the holidays.

The schedule for recruit processing at Ft. Leonard Wood as at the other TRADOC CIIPs provides for two separate phases of issues. Phase I issues occur on Day 1 at the Reception Battalion, and can occur on any day. Thursday, Friday and Monday are the heaviest days. Phase 2 issues are scheduled to occur during the 5th week of training but recruits can arrive anytime. Graduation from Recruit Training program occurs at the end of the 8th week. Personnel noted they adjust the Shipping Plan (Recruit Accession Plan) information entered into ACIIPS based on "local knowledge," i.e., years of experience. During the summer months, orders are adjusted in anticipation of the "Summer Surge".

Status at the time of the site visit by the ARN Team on 22 September 1998 was as follows:

- Current on hand value $4,874,608
- Current RO Supply $7,173,594
- Current Dues-In $460,000

These levels were subsequently reduced to minimums as the capitalization/de-capitalization approached, i.e., conversion from TRADOC ownership to DSCP ownership with QLM/Local operation. War reserve (or surge) stock is not held on the post, and was not part of the routine CIIP responsibility; therefore, no information was collected with regards to the metrics for war reserves.

The following table shows that based on an estimated bag cost of $1,100 and a projection of 22,000 recruits per year, Ft. Leonard Wood was expected to use just over $2 million worth of inventory on a monthly basis or just over $24 million annually.

Budgeted Recruits	Estimated Bag Cost	Annual Expense	Estimated Monthly Expense
22,000	$1,100	$24,200,000	$2,016,667

Table 2 – Ft. Leonard Wood Monthly Expense Projections

These figures are confirmed by the information shown in the next table (Table 3). This table provides an analysis of the dollars of inventory issued by the Ft. Leonard Wood Clothing Initial Issue Point during the months since the QLM/Local and VIM-QLM/Central systems were implemented for managing and replenishing inventories located at this CIIP.

As shown, the results indicate that during the months immediately following go-live, there was a significant variation in the budgeted monthly expenditures as compared to the actual monthly issues. This was not unexpected, and it is projected that the figures will converge as additional months of experience become available through on-going operations. This fine-tuning of the system will ultimately provide a year's worth of historical information that will be used for managing supply replenishment. Of course, the actual results achieved will be dependent on the accuracy of the recruit forecasts that are to be used to plan for future inventory requirements.

Ft. Leonard Wood Dollars Issued Analysis by Month								
Activity Month:	Feb-00	Mar-00	Apr-00	May-00	June-00	July-00	Aug-00	Sept-00
Days in Month:	29	31	30	31	30	31	31	30
Dollars Issued:	$1,425,346	$1,876,272	$1,145,280	$1,674,568	$2,644,606	$2,069,704	$2,703,827	$2,102,715
Average Daily Usage:	$49,149	$60,524	$38,176	$54,018	$88,153	$66,764	$87,220	$70,090
Budgeted Average Daily Usage:	$69,540	$65,053	$67,222	$65,053	$67,222	$65,053	$65,053	$67,222
Average Daily Usage Variance:	-41.49%	-7.48%	-76.08%	-20.43%	23.74%	2.56%	25.41%	4.09%

Table 3 – Ft. Leonard Wood Inventory Issue Analysis by Month

As shown in the following graph (Figure 4), the actual number of recruits processed at the CIIP does not closely track the budget for new recruits. This variation resulted in some difficulties in the early days of operation since the inventories had been significantly reduced as part of the capitalization/de-capitalization cutover process.
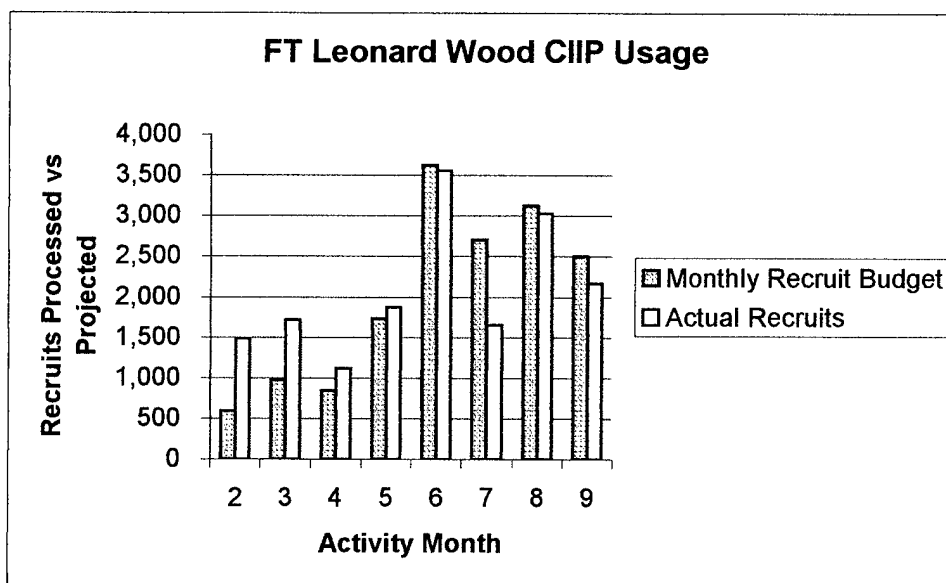

Figure 4 – Ft. Leonard Wood CIIP Usage

The following table (Table 4) shows the fluctuation in the recruit load factor at Ft. Leonard Wood on a month-to-month basis from February to September. This table only shows data from part of the year and indicates the importance of accurate forecasts for the recruit load factor. In the first months of operation, inventory shortages were created due to the extreme reduction of the on-hand inventory values just prior to the capitalization/de-capitalization cutover that occurred when the inventory was converted from TRADOC ownership to wholesale local inventory owned by DSCP.

Period	Total Units Issued	Monthly Recruit Budget	Fiscal Year Recruit Budget	Monthly Recruit Factor	Actual Recruits	Recruit Variance
Feb-00	124,982	595	23,019	0.3102	1,484	149%
Mar-00	153,253	977	23,019	0.5093	1,717	76%
Apr-00	95,319	846	23,019	0.4410	1,114	32%
May-00	144,979	1,734	23,019	0.9039	1,874	8%
Jun-00	258,296	3,624	23,019	1.8892	3,553	-2%
Jul-00	158,753	2,703	23,019	1.4091	1,652	-39%
Aug-00	244,899	3,128	23,019	1.6307	3,029	-3%
Sep-00	187,366	2,501	23,019	1.3038	2,168	-13%
	1,367,847	16,108	23,019		16,591	3%

Table 4 – Ft. Leonard Wood Recruit Load Factor & Recruit Variance

Inventory values vary over time based on the requirements to meet recruit load or processing requirements, i.e., during summer surge periods the inventory levels are maintained at a higher level than during the winter when the number of recruits being processed is lower. In February 2000, as noted earlier in this report, the month-end inventory value was $4,321,362.05 or about 56 annualized days of supply. Additional information on month-to-month levels after the go-live process may be found on the ARN home page or is available from DSCP, Ft. Leonard Wood, or AdvanTech.

7.0 SUMMARY OF BENEFITS ACHIEVED

This project has provided several benefits and a substantial return-on-investment for DLA and DSCP. It continues to enhance management of the Ft. Leonard Wood Recruit Training Center wholesale local ("retail local") inventory. Benefits have been provided through the development and implementation of comprehensive decision support tools based on the proven concepts and approaches of the QLM system previously installed at Marine Corps Recruit Depot-San Diego to support operations at that CIIP.

VIM is being used today as a common user interface, i.e., application front-end, to access the VIM-QLM/Central decision support capabilities, and the MILSTRIP data mirrored from ACIIPS at FLW to QLM/Central, ASCOT to SAMMS and back to QLM/Local. VIM provides access to QLM/Central databases and functions and to the information and data in the AAVS DataMart for DSCP and CIIPs Item Managers to extract data on all current asset inventories for review. The system also provides for support and management of the related requisitions in SAMMS.

VIM-QLM/Central extracts essential data from the AAVS DataMart and provides both RTC and DSCP Item Managers with the ability to manage inventories in support of end-user requirements. This includes support capabilities based on recruit load factors, the unique "shipping" plans for the CIIP, and other policy directives or locally established performance parameters.

VIM-QLM/Central is providing on-going decision support capabilities for DSCP Item Managers to evaluate stockage levels and replenishment requirements at the FLW CIIP and at all other related asset inventory locations as desired and directed. These capabilities are providing DSCP Item Managers with the ability to manage the redistribution of assets from DSCP Depots and "Bill & Hold" locations to the appropriate location to support FLW as well as other RTCs. In addition, the incorporation Balanced Inventory Flow Replenishment System-Wholesale (BIFRS-W) concepts into the VIM-QLM/Central capabilities will enable DSCP Item Managers with the essential abilities to balance the flow of goods manufactured by "bill and hold" vendors.

The initial estimates of the benefits of VIM-QLM/Central viewing and managing local and remote assets were based on the business cases previously prepared by both Cal Poly and Clemson Demonstration Projects with objective support provided by the Logistics Management Institute. The projections for the ARMY CIIPs including FLW indicated approximately $30,000,000 of wholesale inventory drawdowns would be achieved from the enhanced management of the RTC Retail inventories (see Cal Poly Business Case and accompanying Logistics Management Institute projections). In addition, an estimated $2-4,000,000 inventory reduction would occur at each additional Recruit Training Center supported with VIM-QLM/Central and QLM/Local capabilities.

Thus, VIM-QLM/Central and QLM/Local systems provide the Retail and DSCP Item Managers with the essential abilities to affect both the Retail and the Wholesale inventory draw down objectives, and to monitor and report on progress achieved. The initial

reduction in inventory at Ft. Leonard Wood prior to the capitalization/de-capitalization amounted to $3.4 million.

There were numerous lessons learned from this development project with the installation of QLM/Local at Ft. Leonard Wood and the refinement of activities with VIM-QLM/Central. As part of the lessons learned, this initial inventory draw down over-shot prudent reductions and caused an initial shortage for a short period of time. Detailed information on the results achieved is provided elsewhere in this report.

Ultimately, the results achieved proved the concepts for centralizing the ownership of the inventories at the CIIP locations with replenishment handled as part of an integrated management of wholesale inventories. Thus, this project provided a sound framework for the future expansion of these concepts for future enhanced support of the Recruit Training Centers by the Defense Supply Center Philadelphia.

APPENDICES

Appendix A – Definition of Terms

Appendix B – Project Personnel

Appendix A – Definition of Acronyms

The following acronyms are used in this report and are provided to provide clarity of understanding for the reader.

♦ **ACIIPS** – The Department of the Army's Automated Clothing Initial Issue Point System. This was originally developed on a mini-computer and later moved from IBM System 34-36-38 hardware to an IBM AS400.

♦ **ACIIPS/R** – The revised Automated Clothing Initial Issue Point System. This system incorporated new hardware and software to minimize potential year 2000 problems (Y2K) and was designed to operate under the Microsoft Windows NT operating system.

♦ **ARN** – Apparel Research Network made up of selected industry and academic partners working together to develop innovative solutions for the Apparel industries support of military departments.

♦ **ASCOT** – Automated System for Cataloging and Ordering Textiles

♦ **ARN AAVS** – the ARN Asset Visibility System being developed to provide asset visibility across the supply chain (i.e., all locations) to DSCP Item Managers and others.

♦ **ASAP** – The Automated Supply Apparel Processing (ASAP) Internet Web based capability for use by manufacturers in reporting status of work in process and quantities of finished goods in their respective inventories.

♦ **BDU** – Battle Dress Uniforms, commonly referred to as fatigues.

♦ **C&T** – Clothing and Textiles Division of the Defense Supply Center Philadelphia.

♦ **CIF** – Central Issue Facility. This facility provides for consolidated storage and issue of items that are issued for exercises and then returned for storage until they are again needed, e.g., tents, flak jackets, canteens, sleeping bags, etc.

♦ **CIIP** – The Clothing Initial Issue Point referring to the locations where recruits are inducted into a branch of the military and receive their initial issue of clothing.

♦ **CRF** – Clothing Reclamation Facility. Area where items that are either new or used are returned for processing and classified for reissue.

- **DFAS** – Defense Finance Accounting System - This system interfaces with DSCP for financial activities such as receiving verification. This platform tracks authorizations for vendor payments.

- **DoD** – Department of Defense.

- **DODAAC** – Department of Defense Activity Address Code –Used to identify source or destination of electronic financial information as a "cost center."

- **DOS** – Day Of Supply.

- **DSCP – Defense Supply Center Philadelphia** - DSCP controls the procurement and distribution of Medical, Subsistence (i.e., food), and Clothing and Textiles commodities to Defense Logistics Agency (DLA) depots and stock record accounts, worldwide.

- **DVD** – Direct Vendor Delivery system where a vendor provides supplies ordered directly to the customer rather than first shipping the items to a depot.

- **EDI** – Electronic Data Interchange standards are used to facilitate computer-to-computer information transfers to achieve timely, accurate transfer of ordering data and related transactions.

- **EOQ** – Economic Order Quantity

- **Shipping Plan** – This document details the number of recruits the CIIP plans to train per year and the planned arrival dates at the Clothing Initial Issue Point.

- **MILSTRIP** – Military Standard Replenishment System

- **NSN** – National Stock Number

- **OL** – Operating Level

- **OST** – Order Ship Time

- **QDR** – Quality Deficiency Report. These are used to track items that are outside acceptable standards for issue to recruits. These reports provide for communication with DSCP Item Managers regarding problems of quality that are encountered.

- **QLM** – Quality Logistics Management^{TM} – Material Management inventory system supporting acquisition, issues and distribution and predictive forecasting.

- **QLM/Central** – The Virtual Item Manager (VIM) system is comprised of several components or modules. The VIM-QLM/Central software module provides the decision support system capabilities for managing wholesale stocks and supply redistributions to end-use customers based on analysis of forecasted and actual usage and inventory availability.

- **QLM/Central "Lite"** – This was an interim solution during the prototyping and development of the QLM/Central and VIM capabilities. Initially, the data transferred from the ACIIPS at FLW was maintained in a "stockroom" of the QLM/Central "Lite" application. This was specifically set up to permit AdvanTech and designated Item Managers to manage the DSCP-owned stock at FLW until the function was transferred to VIM-QLM/Central with issue data accounted for through SAMMS.

- **QLM/Local** – The QLM software implemented as a "wholesale local" inventory management system supporting acquisition, distribution and predictive forecasting at Ft. Leonard Wood as a prototype for future sites. The system provides a "local" capability to manage wholesale inventory assets located at the CIIP including receipt and inventory adjustment processing.

- **QLM/Retail** – The QLM software with enhancements implemented as a retail inventory management system supporting acquisition, issues and distribution and predictive forecasting at Marine Corp Recruit Depot-San Diego with interfaces to ASCOT and the Marine Uniform Materials Management System (MUMMS).

- **RIC** – Routing Identifier Code – Refers to a code used in SAMMS for identification of location where materials are to be shipped.

- **RO** – Requisition Objective

- **ROF** – Reorder Frequency

- **ROQ** – Reorder Quantity

- **ROP** – Reorder Point

- **RTC** – Recruit Training Center (includes Army CIIPs) – These are the facilities operated by the different departments of the military where new recruits are inducted for basic training.

- ◆ **SAMMS** – Standard Accounting and Material Management System - This system is used by the Defense Logistics Agency, Defense Procurement Support Center.

- ◆ **SASS** – Support Activities Supply System - This system is interfaced to MUMMS at the base operations level. This is a Marine Corps "mainframe" platform used to support Operational Marine Units (also called the "Fleet Marine Force". There is no SASS interface with DSSC for clothing management. SASS supports base level programs such as the desks, chairs and other property management commodities.

- ◆ **SL** – Safety Level.

- ◆ **STANFINS** – Standard Financial Management System used by the Army for financial management activities.

- ◆ **SARSS** – Standard Army Retail Supply System.

- ◆ **STARFIARS-MOD** – Standard Financial Inventory Accounts and Reporting System – Modified planned as the replacement for STANFINS.

- ◆ **VIM** – The Virtual Item Manager (VIM) system incorporates operational data extracted from the SAMMS Clothing & Textile (C&T) server as the basis for the operational and decision support capabilities provided in a single source of information for Item Managers at the retail (Recruit Training Centers) and wholesale (DSCP) level.

- ◆ **VPV** – Virtual Prime Vendor

The following guidelines and checklist were developed for use in completing the site survey process as part of the implementation activities for QLM/Local at subsequent ARMY CIIPs.

<div align="center">

AGENDA

SITE SURVEY

PROCESS & CHECKLIST

</div>

1.   **Introductions and Objectives**

2.   **Initial Briefing, Discussion & Information Gathering**

3.   **Tour Facility & Gather Information**

4.   **Exit Briefing/Discussion**
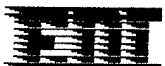
CIIP SITE SURVEY DISCUSSION POINTS AND CHECKLIST

1. General Information:

a. **Accession Data** – Provide information on the projected number of recruits to be processed by the CIIP during the current fiscal year and previous fiscal year. Are there any significant fluctuations in monthly volumes of recruits processed? How big is the fluctuation? Are there any significant changes expected in the near future, e.g., additional recruit battalion to be added, etc.?

b. **Inventory dollars** – Discuss the current inventory operating levels and the expected level after go-live conversion (cap/decap).

c. **Number & Types of Employees to be Trained** – Review the current operational staffing levels and discuss briefly the numbers and types of employees to be trained, e.g., System Administrator, Receipt Processing, Data Entry, etc. List by name and position title/function.

d. **DSCP Prime Vendor & DVD Contractor Support** – Discuss the support of the CIIP by the DSCP Prime Vendor (if applicable), and Direct Vendor Delivery support. In particular, is there a dedicated truck and what is the usual and customary delivery time? Any support problems or concerns that should be considered or addressed?

e. **Special Measurements** – Discuss the current processing of Special Measurements and note that these are not supported via QLM since QLM handles only items with standard NSNs. Discuss the use of ASCOT for on-line processing of Special Measurement Orders.

f. **Returns to Wholesale Inventory** – CIIPs are not currently allowed to return stock to the QLM/Local CIIP inventory.

g. **Primary RTC Point of Contact and System Administrator** – Discuss the functions of the System Administrator briefly and identify the local primary and alternate System Administrator.

h. **RTC Implementation Work Group** – Identify the individuals that will be key to the implementation process. (Consider the DOIM personnel for telecommunications issues, facilities personnel if appropriate, etc.)

2. Logistic Data

a. **NSNs Stocked** – Discuss system parameters for average daily usage by NSN

b. **Budget Performance** – Briefly review average monthly dollar flow

c. **Stock Master with weekly updates** (pricing) at T-4 weeks (issues, stock status)

d. **Primary Source of Supply** – Which depots & manufacturers are supplying the CIIP?

e. **Order Ship Time** – Discuss any issues or concerns with Order Ship Time.

f. **Locator System** – Build Bin and bulk locations as early as possible.

g. **Temporary Holding Areas for Stock Segregation** – Discuss need for and location of separate hold areas for DSCP inventory versus CIIP inventory during the 2 week switch over

3. Facility Description

a. **Storage Space** – Review CIIP operation space and storage of inventory.

b. **Operational Concept and Procedures** – Review current operations and inventory flow and processing.

c. **ACIIPS Location** – Determine specific shipping location for hardware delivery.

4. Site Preparation

a. **Hardware** – PC Server with product code scanner (T-5)

b. **Power** – Availability of power

c. **Commercial telephone line for FTP**, pcAnywhere, Internet – to avoid the local firewall

d. **Commercial telephone contact**

e. **Point of Contact Information** – Building number, room number and point of contact for phone drop

f.   **Internet** to and from DataMart and SAMMS and QLM/Central "Lite"

g.   **Local ISP** name, address, and telephone number

5.   Installation & Operation

a.   User Manual and Training

b.   Primary work will be with two screens

     (1)   Inventory Adjustments Screen

     (2)   Entry of DSCP Receipts (scan 1348-1 into system)

c.   System Administrator

     (1)   Security and user access

     (2)   Reports

     (3)   ATI Web site = current orders and status

Appendix C – Project Personnel

The following personnel were involved in various phases or tasks for this project. Each of these individuals played key roles and worked closely together in achieving the desired results from the new systems developed and implemented in support of Ft. Leonard Wood operational needs.

Charles Ballinger – TRADOC Logistics Systems Specialist

Robert E. Bona – AdvanTech Deputy Project Manager, Operations & Programming Support

Dennis Brekhus – Electronic Data Interchange, Inc. (EDII) Project Manager

Denise Carley – ARN Principal Investigator for Electronic Data Interchange, Inc. (EDII)

Gary Colello – Item Manager & Supervisor, DSCP

Sally DiDonato – Clothing & Textiles Branch Manager DSCP

Jean Gipe – ARN Partner for Cal Poly Demonstration Project

Gordon Heathcock – TRADOC ACIIPS Program Support

Dawn Hustis – TRADOC ACIIPS & ACIIPS/R Program Manager

William Kernodle – ARN Partner for Clemson Apparel Research

John McAndrews – Item Manager & Supervisor, DSCP

Kathleen Moore – Assistant to ARN Project Manager

Richard A. Perrin – AdvanTech Project Manager

Janet Stevens – Supervisor & Assistant to Clothing Branch Manager, Fr. Leonard Wood CIIP

Julie Tsao – ARN Project Manager, DLA

Kitty Tully – TRADOC Logistics Program Management & Support

Leroy Ward – AdvanTech Implementation & Training Support

Denver Williams – Clothing Branch Manager, Ft. Leonard Wood CIIP

Appendix D - ARN Supply Chain Management Final Technical Reports

The following reports provide additional material related to other ARN Projects and Supply Chain Management initiatives.

Title	Organization	Date	DTIC Accession Number
Virtual Prime Vendor T1P1 Short Term Project - QLM/Retail at MCRD - San Diego (Includes FLW Assessment)	California State Polytechnic University Pomona Apparel Technology and Research Center	10/99	ADA373865
ARN Program P.D.I.T. Final Technical Report (AAVS, ASAP)	Product Data Integration Technologies, Inc.	4/00	ADA378606
Year 1-3 Demonstration Manufacturing (BIFRS)	Clemson Apparel Research	9/99	ADA369941

These reports are available on the ARN web site at http://arn.iitri.org.

Copies of these reports in PDF format are available from the Defense Technical Information Center at: http://stinet.dtic.mil.